Inland Lakes and Depressional Wetlands

Theme Assessment

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Primary historical approaches and research areas covered: Research on inland lakes was historically conducted by biologists at the Institute for Fisheries Research with some work conducted by staff at the Pigeon River and Hunt Creek stations. There has been no research effort of note dedicated to the study of depressional wetlands. Research on inland lakes has always had a strong field survey component. During the 1940s and 1950s sampling crews, organized out of the IFR, conducted comprehensive statewide surveys on lakes. This work included lake mapping, substrate typing, lake shore assessments, macrophyte assessments, water quality and benthos sampling, and fish community assessments. Since that time, much of the work on inland lakes has been largely species–specific with sport fishes such as bluegill, walleye, and bass the primary species of interest. Most inland lake research has focused on management evaluations, sampling issues, population dynamics, and habitat relations. Much of the work has involved observations or experimentation on individual lakes with more controlled experiments being conducted in the lakes at Hunt Creek and in the Saline ponds. In addition there has been some laboratory work conducted at the Saline facility. No research strategy for inland lakes was found. It is likely that most research was undertaken either in response to crises or based on the preference of individual biologists.

More recently, with the implementation of the status and trends program emphasis has refocused on comprehensive statewide lake surveys using standard methods. There has also been some attention placed on fish energetics, and an increase in the use of emerging technologies such as GIS, relational databases, and hydroacoustics. Has there been any genetics work on inland lake populations of fish?

Summary of current research work: This summary of current research work is based on the lists of studies for 2006. This list contains studies conducted by research section personnel including PERM staff and funded by various sources. Currently there are 14 studies being conducted within the Inland Lake and Depressional Wetland theme. However, there are no current studies focusing on depressional wetlands (there was a student supported project for classification of wetlands that ended in this year). The breakdown of studies by major research area is as follows: Management Evaluations (4), Sampling (3), GIS Development (2), Population Dynamics (2), Habitat Relations (2), and Ecosystems (1). Because most of these studies are continuations of earlier projects (with some amendments), the distribution of studies across these research areas has been fairly consistent over the past 5 years.

Studies under Management Evaluations are focused on strain evaluations (2), evaluation of the inland stocking program (1), and development of fisheries assessment and harvest allocation methods on large lakes (now modified to include streams). Studies dealing with Sampling are focused on the design and sampling methods associated with the status and trends program. Studies under GIS Development include the digital atlas for inland waters, and the development of decision support tools for managing fisheries of inland lakes. Studies dealing with Population Dynamics include fisheries assessments in large inland lakes, and a laboratory-based experiment evaluating prey selection and predation rate of piscivorous fish. Studies dealing with Habitat Relations are focused on determining the implications of lakeshore development for fishery resources and evaluating effects of watersheds and aquatic plants on lake resources. The study under Ecosystems (ecological inventory of inland lakes) involves the analysis and summary of the status and trends data for inland lakes.

Research needs identified from other sources: Various sources were consulted to identify research needs for inland lakes and depressional wetlands. These sources included Fish Division's annual Areas of Emphasis, Smallmouth and Largemouth Bass Regulations Committee (SALBRC) recommendations, Michigan's Wildlife Conservation Strategy, research priorities

developed at the 2003 research meetings, Basin Teams, and University faculty, DEQ staff, and Fish Division personnel that work on lakes. Below is a listing of needs identified by source.

Fish Division's annual areas of emphasis

- Design studies to begin filling the gaps in our knowledge of black bass in MI, and be ready to evaluate any changes in regulations.

SALBRC

- What is the level of angling effort for and exploitation of black bass in the state of Michigan by fishing type, across time, across space?
- What are the effects of angling on reproductive success and survival of individual black bass, and under what conditions do black bass populations have the compensatory capacity to offset negative effects of fishing on nesting success and survival?
- How do characteristics of the environment mediate population demographics of black bass, and their effects on aquatic ecosystems?

Michigan's Wildlife Conservation Strategy–Research and Monitoring

- Identify and undertake specific research and survey needs that will address gaps in knowledge related to threats, landscape features and species, and relationships between them.
- Assess the overall success of the program.
- Monitor threats.
- Monitor the spatial extent and condition of landscape features.
- Monitor the status of rare, declining and indicator species.
- Assess responses to specific conservation actions and use results to re-evaluate current conservation actions and recommend new ones (i.e. adaptive management).

Highest priority threats identified in Conservation Strategy (relevant to lakes and wetlands)

- invasive species,
- wetland modification,
- Dredging,
- Riparian modification.

Research priorities developed at the 2003 research meetings (rank)

- Macrophytes (1),
- Benefit/cost analysis of division programs (1),
- Development (landuse? Shoreline?) (1),
- Resource allocation-tribal/recreation (2),
- Human dimensions (value of inland fisheries) (3),
- Dredging/filling (3),
- Support tools for division planning, assessment, permits (3),
- Trophic interactions among fish (4),
- Nuisance species (5),
- Insufficient info on T and E species (6),
- Ignorance/education (6),
- Preservation of special systems (7),
- Pollutants (8),
- Global warming (9),
- Stunted panfish (9).

Basin Teams, University faculty, DEQ staff, and Fish Division personnel

- Depressional wetlands—need to know more about herps to protect their environment,
- Invasive species (6 responses),
- More ecosystem-based approaches,
- Evaluate catch differences between fyke and trap nets,
- Develop a lake classification system,
- Anticipate research demands stemming from inland tribal harvest,
- Research to support quantitative and active management programs,
- Effects of lakeshore development on fish recruitment,
- Effects of water level management on fish reproduction/recruitment,
- Effects of angler harvest on small lakes,
- Effectiveness of NOP regulations,
- Effectiveness of catch and release regulations on lakes,
- Black bass in relation to change in regulations (3 responses),
- Black bass—energetics of growth and reproduction,
- Black bass—impacts of tournament practices,

Research needs identified at 2005 Research Section Meeting: A break-out session was held at the 2005 research section meeting. Inland lake and depressional wetlands workgroup participants included Rick Clark, James Breck, Bob Haas, Ed Baker, Pat Soranno, Lidia Szabo-Kraft, Glenn Carter, and Reuben Goforth. Below are the research needs for inland lakes that were identified by the group. The first six topics are listed in order of priority as determined by votes from participants. The remaining topics were deemed important but did not receive any votes.

- Classification system (7 votes),
- Effects of invasive species on lake ecosystems (6 votes),
- Develop framework for active management (4 votes),
- Define overfishing (3 votes),
- Black bass research needs identified by SALBRC (2 votes),
- Status and distribution of non-game/threatened and endangered taxa (2 votes),
- Long-term dynamics (ecosystem dynamics not just population dynamics) (1 vote),
- Reference conditions for assessment, conservation, and restoration,
- Effects of human development,
- Aquatic plant management,
- Define fish management objectives,
- User conflicts,
- Predict fish growth, survival, assemblages, and response to regulations,
- Ecosystem role of aquatic macrophytes,
- Herps,
- Mussel habitat,
- Multi-taxa management techniques,
- Standardization of netting effort,

Major research area gaps and priorities: The biggest and most obvious research gap occurs at the "theme" level—there is no prior or current research program on depressional wetlands. Given Fish Division's mission statement and the language presented in the Wildlife Conservation Strategy, wetlands are a critical resource that must be addressed by Fish Division. The inland lake and depressional wetlands workgroup agreed that high priority should be placed on inventory and classification of wetlands, assessment of ecosystem function or role of wetlands, and assessment of ecosystem services wetlands provide. The workgroup also determined that the

lack of expertise in wetlands (including hydrology, plants, herps, and invertebrates) within Fish Division is a major obstacle to the development of a research program in this area. Training, partnering with other groups (MNFI, TNC), and using State Wildlife Grant money to fund wetland research outside the Division were suggested strategies for dealing with this issue.

There are multiple research gaps for inland lakes due to a lack of strategy or framework for how Fish Division prioritizes research. This position is based on a number of lines information. First, decades of research on inland lakes has increased our understanding of some things, but we are still unable to predict the effects of large-scale issues affecting lakes statewide such as regulation changes, habitat destruction, and invasive species. In addition we know very little about non-game species, mechanisms of assemblage structure, and threats. We are therefore unable to identify those species, assemblages, or lakes that are most at risk. These knowledge gaps reflect a lack of a system-based or ecosystem-based approach for assigning research priorities. Rather, than developing a broad understanding of lake structure and function, we have been accumulating a series of not-so-well connected facts about primarily game fish.

Second, research priorities have been largely set through a reactionary process wherein the latest crisis receives the most attention. Chasing crises (or funding) is not a good long-term strategy for the Division. It is interesting to note that the list of research priorities developed at the 2003 research section meeting contained no mention of black bass, a topic that dominates the research needs identified by the majority of sources surveyed for this assessment. In addition, during the 2003 strategic planning for research there was no Wildlife Conservation Strategy and no Forest Certification. It is clear that issues and subsequent priorities (especially at the Division and Department levels) can change very rapidly, and we must consider whether addressing the latest crises obstructs our view of what should be the "true priorities" and places us in a poor position to adequately address current and future needs.

Third, the number of high profile initiatives that impact the Department has grown in recent years. These include the inland tribal case, the Wildlife Conservation Strategy, and Forest Certification. Because of their potential effects on fishery resources, state budgets, and socio-economic and political climates, these initiatives will and have become research priorities. Change is looming over us and will likely be long-term. We must, therefore, anticipate how research will need to adapt in response to these high profile initiatives.

There is a need to develop a research strategy that is ecosystem-based and proactive rather than reactive. Such an approach will generate critical information that will enable the Division to address important management issues without having to "retool" the research agenda every time a new crisis arises and that enables the Division to accommodate the demands placed on research by high profile initiatives.

<u>Broad approaches to address gap areas</u>

- Addressing statewide issues will require adopting active management, ecosystem-based approaches, and GIS/modeling frameworks.
- Continue support for a classification system and promote further GIS development. These tools are necessary to extrapolate research results to other lakes and wetlands, and are integral parts of active management, Wildlife Conservation Strategy, and Status and Trends.
- Promote mixing of new studies with status and trends and large lakes as a means to collect more complete information (benthos, diet, harvest, population dynamics) on individual lakes.

- Determine the extent to which status and trends surveys can meet the needs of ecosystem level issues such as invasive species, black bass, climate change.
- Use status and trends broad scale data to identify patterns and then set priorities for smaller scale studies to investigate mechanisms.
- Develop a research program to support quantitative and active management programs.
- Develop a wetlands research program with partners—(PERM, MNFI, TNC).

Top priority research areas that will advance the research program

I have listed four top priority research areas (one for wetlands and three for inland lakes) because 1) Fish Division lacks expertise in wetland research, and 2) inland lakes are arguable the most valuable waters in the state. It can be argued that priorities one and two could be combined although data from wetlands is generally lacking.

- ***Depressional wetland inventory and classification***
- ***Classification system for inland lakes***
- ***Effects of invasive species on lake ecosystems***
- Development of active management frameworks that would include research to evaluate whether management actions (e.g., regulations, stocking) are meeting management objectives. This would include evaluation of population dynamics, habitat relations, and angler behavior for important species such as game fish (e.g., black bass, walleye, salmonids) and threatened and endangered species (e.g., sturgeon). Because of the recent public attention placed on extending the catch- and-release season on black bass, priority must be placed on smallmouth and largemouth bass research as outlined by SALBRC. Additional research on population dynamics.